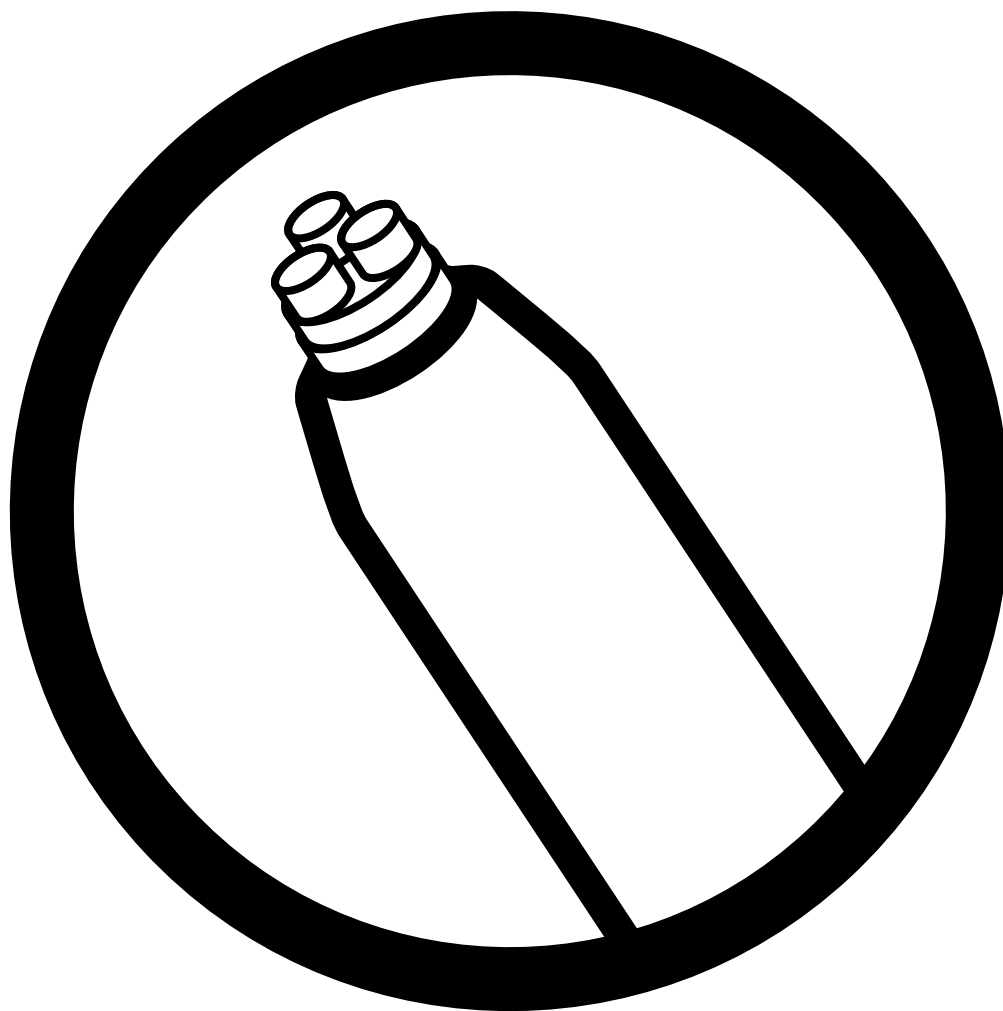


HVS-3-1590
HVS-3-2590
15kV & 25kV Class

Splice for 3/C PILC to 3/C PILC
Power Cable



General Instructions

Suggested Installation Equipment (not supplied with kit)

- Cable preparation tools
- Raychem P42 cable preparation kit or cable manufacturer approved solvent
- Clean, lint-free cloths
- Non-conducting abrasive cloth, 120 grit or finer
- Electrician's tape
- Connector(s) and installation tools
- Raychem recommended torch
- Solder and soldering iron

Recommended Raychem Torches

Install heat-shrinkable cable accessories with a "clean burning" torch, i.e., a propane torch that does not deposit conductive contaminants on the product.

Clean burning torches include the Raychem FH-2609, FH-2629 (uses refillable propane cylinders) and FH-2616A1 (uses disposable cylinder).

Safety Instructions

Warning: When installing electrical power system accessories, failure to follow applicable personal safety requirements and written installation instructions could result in fire or explosion and serious or fatal injuries.

To avoid risk of accidental fire or explosion when using gas torches, always check all connections for leaks before igniting the torch and follow the torch manufacturer's safety instructions.

To minimize any effect of fumes produced during installation, always provide good ventilation of confined work spaces.

Adjusting the Torch

Adjust regulator and torch as required to provide an overall 12- inch bushy flame. The FH-2629 will be all blue,

the other torches will have a 3- to 4- inch yellow tip. Use the yellow tip for shrinking.

Regulator Pressure

FH-2616A1	Full pressure
FH-2609	5 psig
FH-2629	15 psig

General Shrinking Instructions

- Apply outer 3- to 4-inch tip of the flame to heat-shrinkable material with a rapid brushing motion.
- Keep flame moving to avoid scorching.
- Unless otherwise instructed, start shrinking tube at center, working flame around all sides of the tube to apply uniform heat.

To determine if a tube has completely recovered, look for the following, especially on the back and underside of the tube:

1. Uniform wall thickness.
2. Conformance to substrate.
3. No flat spots or chill marks.
4. Visible sealant flow if the tube is coated.

Note: When installing multiple tubes, make sure that the surface of the last tube is still warm before positioning and shrinking the next tube. If installed tube has cooled, re-heat the entire surface.

Installation Instructions

1. Product selection.

Check kit selection with cable diameter dimensions in Table 1.

2. Check ground braid.

Verify that ground braid(s) or bond wire have equivalent cross-section to cable metallic shield.

Raychem HVS-EG supplies ground braid, spring clamp and suggested modifications to make an external ground or shield interrupt.

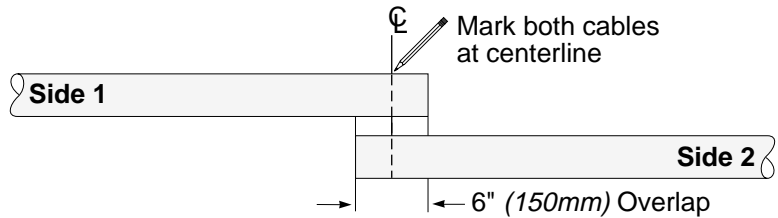
Table 1

Kit	Nominal Cable Range	Insulation Diameter Range	Maximum Connector Dimensions	
			Length	Diameter
HVS-3-1590 Series				
HVS-3-1591	#4-4/0	0.60-1.00" (15-25mm)	3.5" (90mm)	0.90" (23mm)
HVS-3-1592	250-350	0.85-1.10" (22-28mm)	3.5" (90mm)	1.15" (29mm)
HVS-3-1593	500-750	1.05-1.50" (27-38mm)	5.0" (125mm)	1.60" (41mm)
HVS-3-1594	750-1000	1.15-1.75" (29-44mm)	6.0" (150mm)	1.85" (47mm)
HVS-3-2590 Series				
HVS-3-2591	#1-2/0	0.85-1.00" (22-25mm)	3.5" (90mm)	0.90" (23mm)
HVS-3-2592	2/0-350	0.90-1.25" (23-32mm)	3.5" (90mm)	1.15" (29mm)
HVS-3-2593	350-750	1.15-1.50" (29-38mm)	5.0" (125mm)	1.60" (41mm)

Installation Instructions

3. Overlap cables; mark centerline.

Train cables into place and overlap by approximately 6" (150mm). Mark the center line of the overlap.



1789

4. Prepare cables

Find the cable type (Choice 1-2) and follow the directions given.

Table 2

Kit	Jacket Cutback A*	Jacket Cutback B*	Kit	Jacket Cutback A*	Jacket Cutback B*
HVS-3-1590 Series			HVS-3-2590 Series		
HVS-3-1591	18" (460mm)	38" (965mm)	HVS-3-2591	19" (480mm)	41" (1065mm)
HVS-3-1592	18" (460mm)	38" (965mm)	HVS-3-2592	19" (480mm)	41" (1065mm)
HVS-3-1593	19" (480mm)	41" (1065mm)	HVS-3-2593	20" (510mm)	44" (1120mm)
HVS-3-1594	19" (480mm)	41" (1065mm)			

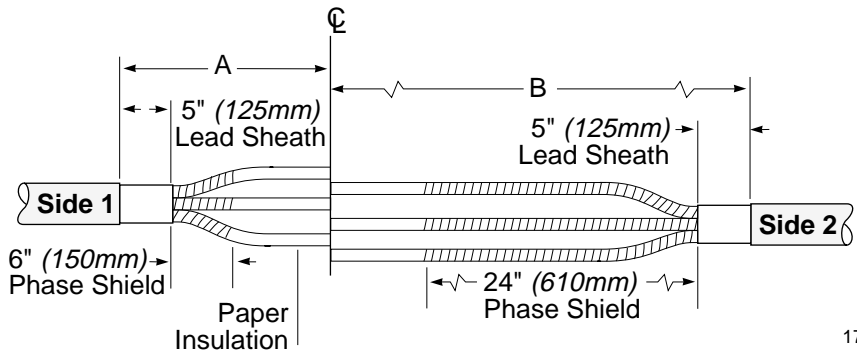
*Mark PILC cable, if unjacketed.

CHOICE 1

3/C Shielded PILC Cable

Cut the Side 1 cable at the mark made in Step 3. *Do not prepare side 2 at this time.* Refer to Table 2 and prepare the Side 1 cable as shown.

Go to Step 5.



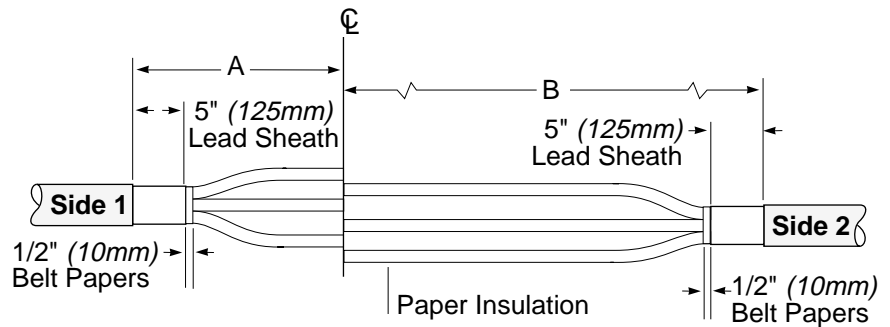
1790

CHOICE 2

3/C Belted PILC Cable

Cut the Side 1 cable at the mark made in Step 3. *Do not prepare side 2 at this time.* Refer to Table 2 and prepare the Side 1 cable as shown.

Go to Step 5.



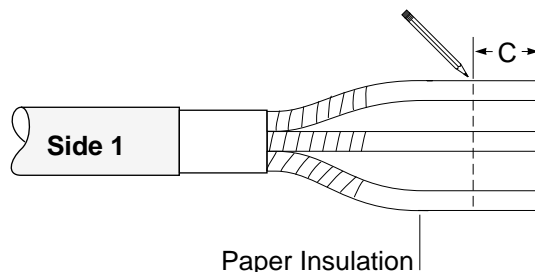
1791

5. Mark insulation.

Calculate Dimension C (shown below) and mark the cable as shown.

$$C = 1/2 \text{ length of connector} + 1-1/2"$$

$$C = 1/2 \text{ length of connector} + 40\text{mm}$$

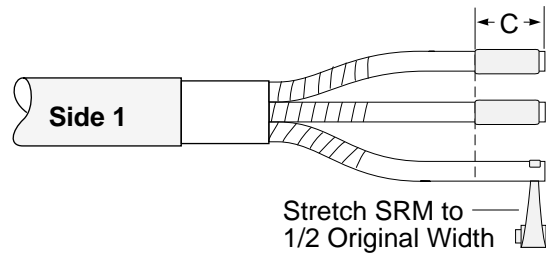


1792

6. Apply Stress Relief Material (SRM).

Remove backing strip from one side of a *long strip* of SRM. Roll up the SRM and remaining backing strip into a convenient size.

Removing the remaining backing strip, tightly wrap one, half-lapped layer of SRM around each phase as shown. Wrap SRM in same direc-

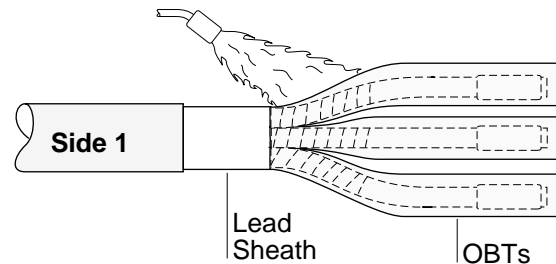


1793

7. Position OBT; shrink in place.

Place an Oil Barrier Tube (OBT) over each phase, butted to the lead sheath (or belt paper) cutback. Shrink the three OBTs in place starting at the lead sheath cutback.

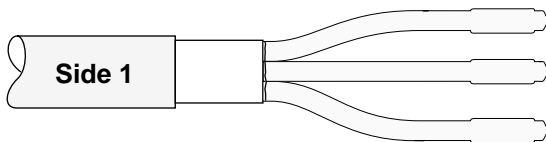
Note: To achieve a smooth, wrinkle-free installation, use a reduced flame to install the thin-walled OBT.



1794

8. Inspect OBTs.

The installed OBTs should have a smooth, wrinkle-free surface after shrinking. Reheat to smooth any wrinkled areas.



1795

Note: Step 9 applies to shielded PILC cable only.

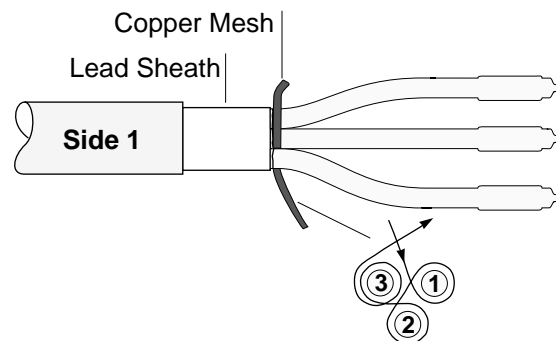
If using belted PILC cable, discard the 1" (25mm) wide copper mesh and go to Page 5, Step 10.

9. Install copper mesh.

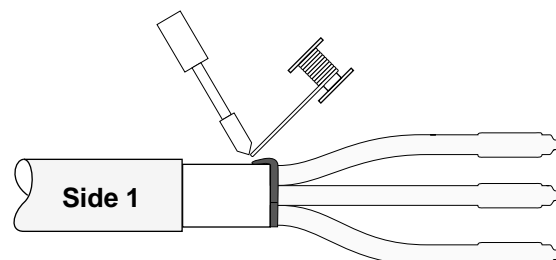
Fold the 1 inch (25mm) wide copper mesh in half lengthwise.

Wind mesh around each phase shield as closely as possible to the lead sheath cut.

Solder copper mesh to the lead sheath. Cut off excess mesh close to lead sheath.



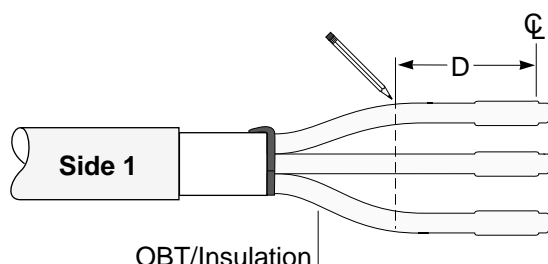
1796



1797

10. Mark OBT/ Insulation at D.

Kit	D	
HVS-3-1590 Series		
HVS-3-1591	6"	(150mm)
HVS-3-1592	6"	(150mm)
HVS-3-1593	7"	(180mm)
HVS-3-1594	7"	(180mm)
HVS-3-2590 Series		
HVS-3-2591	7"	(180mm)
HVS-3-2592	7"	(180mm)
HVS-3-2593	8"	(200mm)

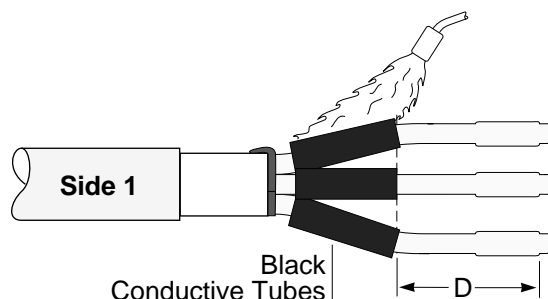


1798

11. Position black conductive tubes; shrink in place.

Place black conductive tube over each phase and position at Dimension D.

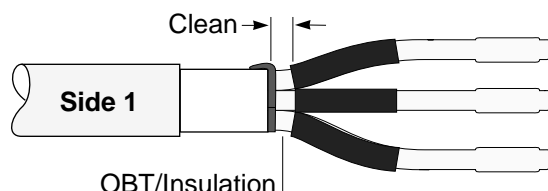
Shrink in place starting at the end nearest to the center of the splice.



1799

12. Clean OBTs.

Using an oil-free solvent, clean the OBT/Insulation, as shown.

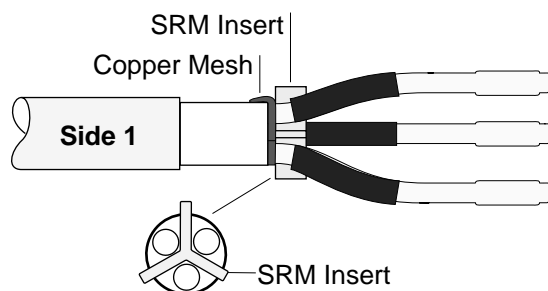


1800

13. Install SRM insert.

Assemble SRM insert per box instructions. Spread the phases and position the insert as shown.

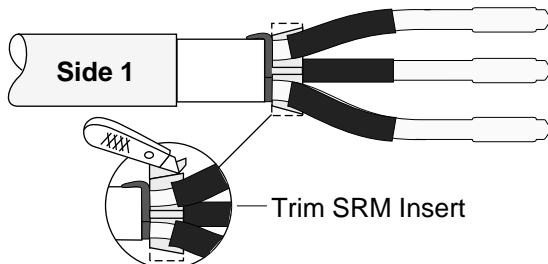
Note: The SRM insert is packaged inside the conductive breakout.



1801

14. Trim excess SRM insert.

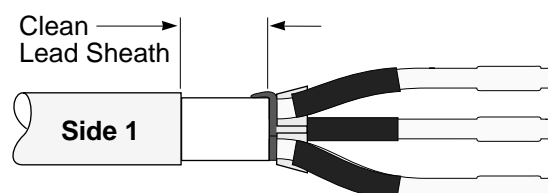
Trim SRM insert to extend 1/8" (3mm) beyond each phase.



1802

15. Clean lead sheath.

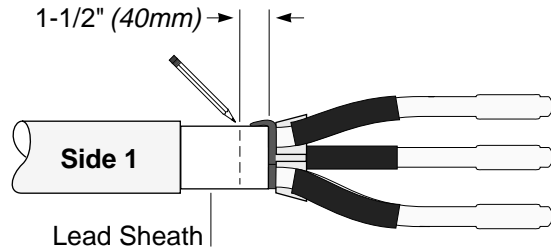
Reclean lead sheath as shown using an oil-free solvent



1803

16. Mark lead sheath as shown.

Note: To ensure SRM to OBT adhesion, gently heat the SRM insert and adjacent OBT before moving on to the next step.

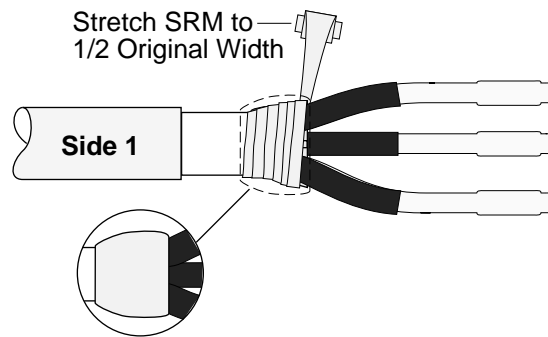


1804

17. Install oil seal.

Remove backing from one side of a *long strip* of SRM. Roll the SRM and remaining backing strip into a convenient size. Removing the remaining backing strip, tightly wrap the SRM from the mark on the lead sheath to the outer edge of the SRM insert. Four to six strips of SRM should be used to build the SRM to the shape shown.

Note: Do not over apply. The finished SRM diameter should not exceed that of the breakout installed in the next step.

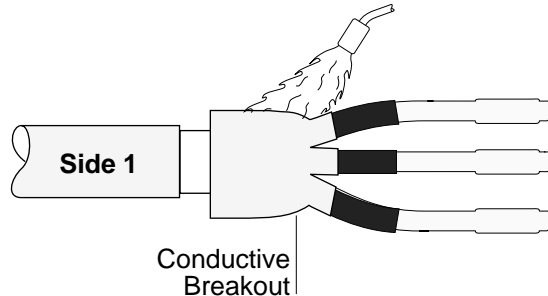


1805

18. Position conductive breakout; shrink in place.

Position the conductive breakout over the SRM so that the inside butts up hard against the SRM.

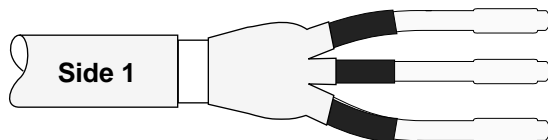
Shrink in place starting at the fingers and working toward the other end.



1806

19. Inspect breakout.

After the breakout has shrunk, continue to apply heat until the breakout has a smooth, uniform surface.

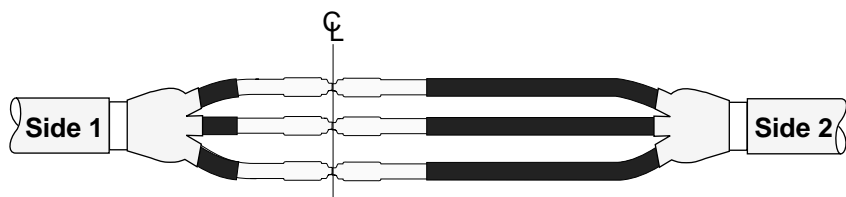


1807

20. Prepare Side 2 cable.

Return to Page 3 and repeat Steps 4-19 to prepare the Side 2 cable.

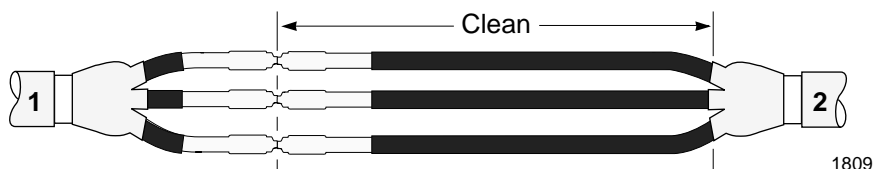
When Side 2 cable is prepared, continue on to Step 21.



1808

21. Clean cables.

Clean Side 2 conductors as shown.



1809

Table 3

Kit	Maximum Connector Dimensions		Kit	Maximum Connector Dimensions	
	Length	Diameter		Length	Diameter
HVS-3-1590 Series			HVS-3-2590 Series		
HVS-3-1591	3.5" (90mm)	0.90" (23mm)	HVS-3-2591	3.5" (90mm)	0.90" (23mm)
HVS-3-1592	3.5" (90mm)	1.15" (29mm)	HVS-3-2592	3.5" (90mm)	1.15" (29mm)
HVS-3-1593	5.0" (125mm)	1.60" (41mm)	HVS-3-2593	5.0" (125mm)	1.60" (41mm)
HVS-3-1594	6.0" (150mm)	1.85" (47mm)			

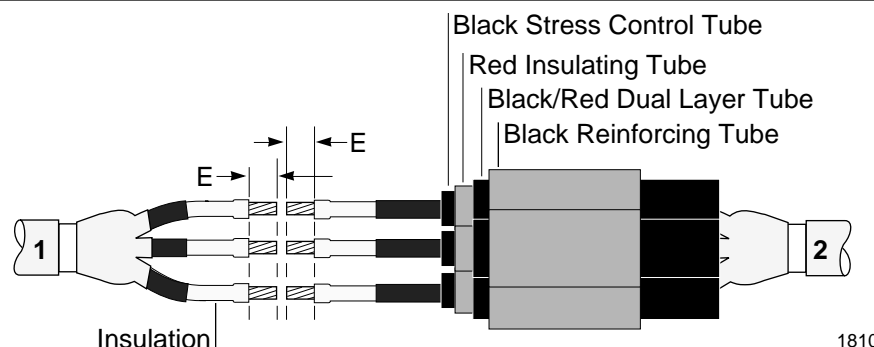
22. Position tubes; remove insulation.

Place one set of nested tubes over each clean Side 2 conductor.

Refer to Table 3 and calculate Dimension E (shown below) and cut back insulation.

$$E = 1/2 \text{ length of connector} + 1/2"$$

$$E = 1/2 \text{ length of connector} + 10\text{mm}$$

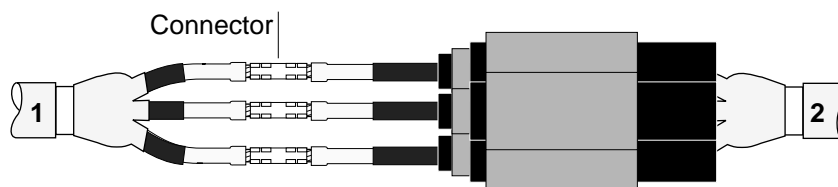


1810

23. Install connectors.

After installation, deburr connections.

Note: If using sweated (soldered) connectors, protect OBTs from hot metal splashes by wrapping with a protective tape. To ensure an efficient oil block, presweat the conductors before fitting connectors.

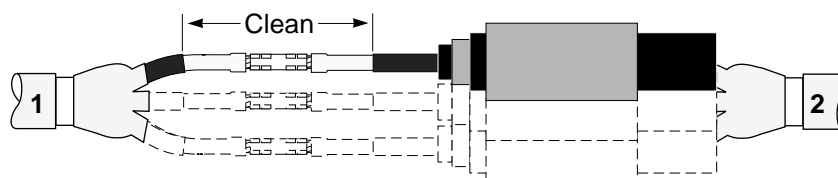


1811

24. Clean connector area.

Complete Steps 24-28 working on one phase at a time.

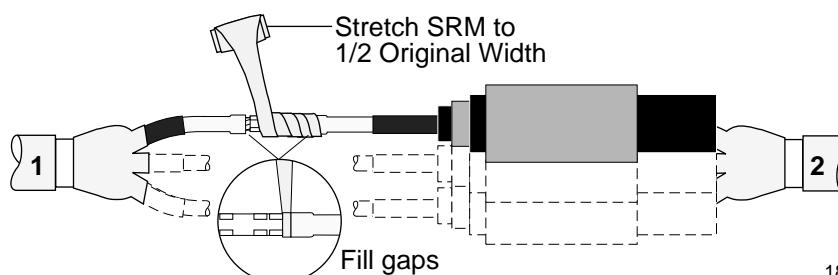
Using an oil-free solvent, clean the insulation as shown, paying particular attention to the OBT/insulation surface.



1812

25. Apply SRM over connector.

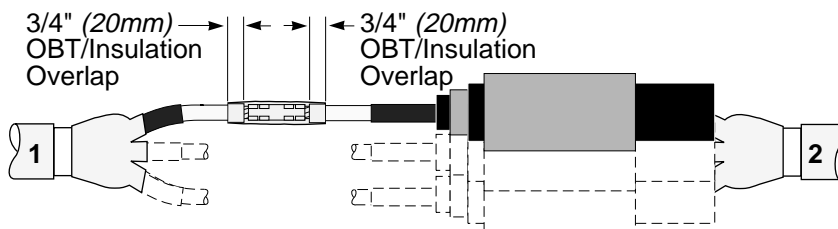
25a. Remove backing from one side of a *long strip* of SRM. Roll the SRM and remaining backing strip into a convenient size. Removing the remaining backing strip, tightly wrap the SRM around the connector and exposed conductor. Be sure to fill the gaps and low spots around the connector.



1813

25b. Continue to wrap the SRM onto the insulation/OBT as shown.

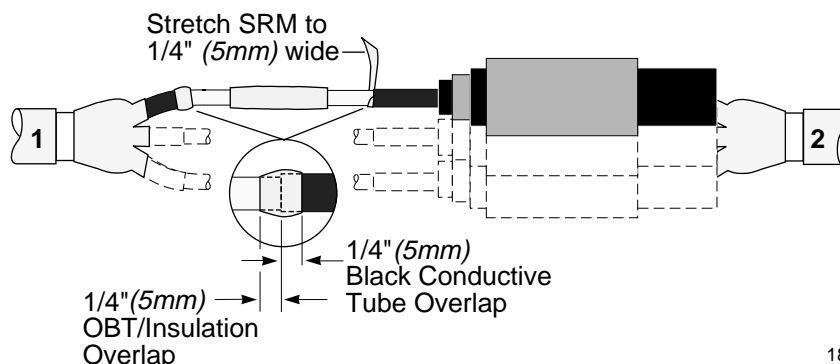
Note: If the connector diameter is larger than the insulation diameter, apply two tightly wrapped half-lapped layers of SRM over the entire connector. Discard any excess SRM (long strips).



1814

26. Apply SRM at black conductive tube steps.

Remove backings from the *short angle-cut piece* of SRM. Place tip of SRM at black conductive tube step and tightly wrap to fill the step. Overlap black conductive tube and OBT/Insulation and taper down to meet OBT insulation as shown.

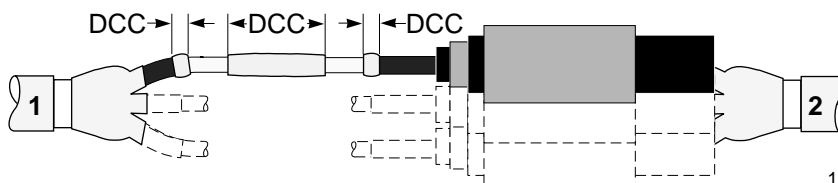


1815

27. Apply Discharge Control Compound (DCC).

Snip open the end of the DCC ampule and apply a thin film of compound over the three applications of SRM.

Apply thin film of DCC over installed SRM

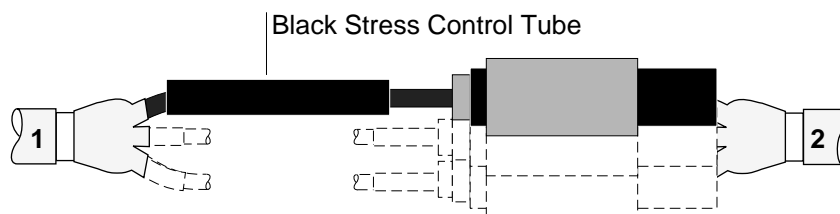


1847

28. Position black stress control tube.

Center black stress control tube over the completed connector area.

Repeat Steps 24-28 for the remaining phases.

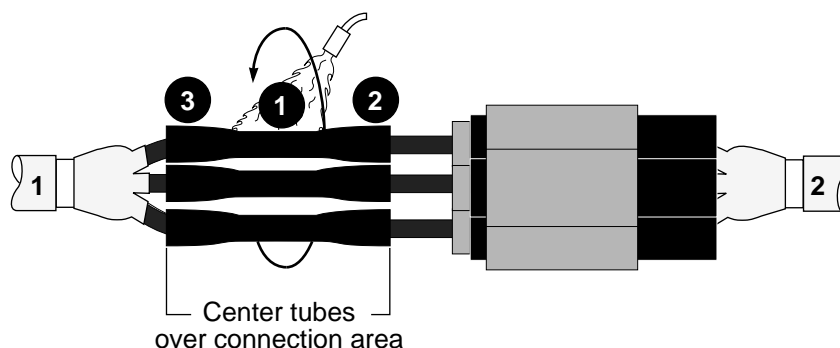


1816

29. Check position of black stress control tubes; shrink in place.

Make sure that each tube is centered over the connection area. Shrink all three tubes in place at the same time.

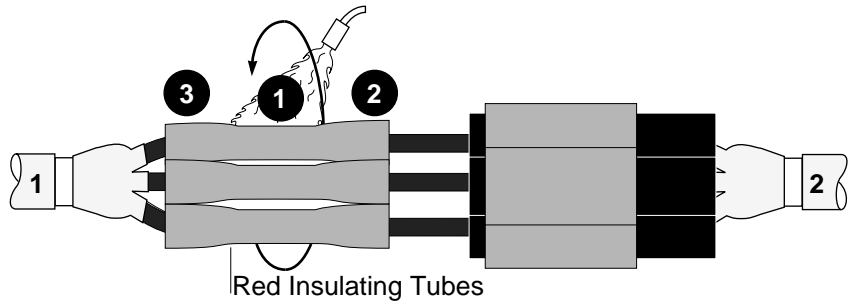
Begin shrinking at center of tubes (1), working torch with a smooth brushing motion around the tubes. After center portions shrink, work torch as before toward one end (2), then to the opposite end (3). Apply sufficient heat to ensure softening of the SRM, indicated by a smooth surface profile.



1817

30. Position red insulating tubes; shrink in place.

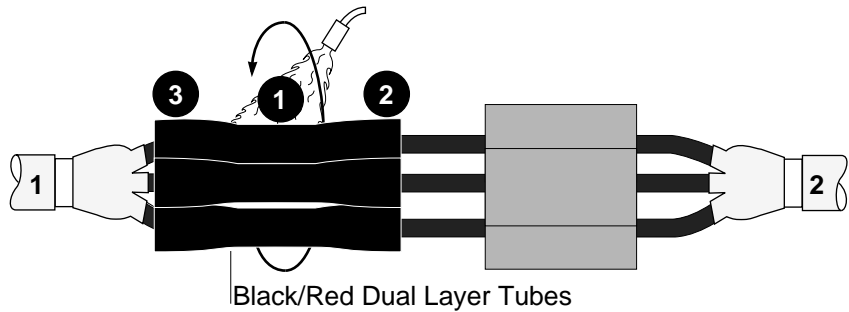
Center tubes over the black stress control tubes. Shrink in place using the same method as in Step 29.



1818

31. Position black/red dual layer tubes; shrink in place.

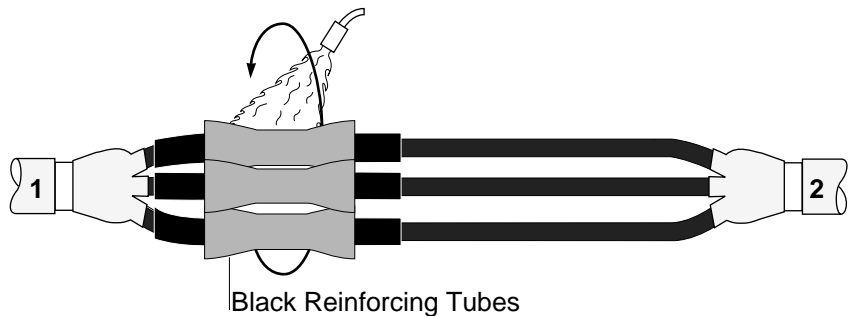
Center tubes over the red insulating tubes. Shrink in place using the same method as in Step 29.



1819

32. Position black reinforcing tubes; shrink in place.

Center tubes over the black/red dual layer tubes. Shrink in place using the same method as in Step 29.



1820

Note: If External Grounding

Go to Step 34, page 10.

33. Install ground braids without external grounding.

Space the 3 ground braids evenly around the lead sheath and solder in place.

Lay the braids across the splice tubes and solder to the lead sheath of the other side. Deburr the connection and cut off excess braid.



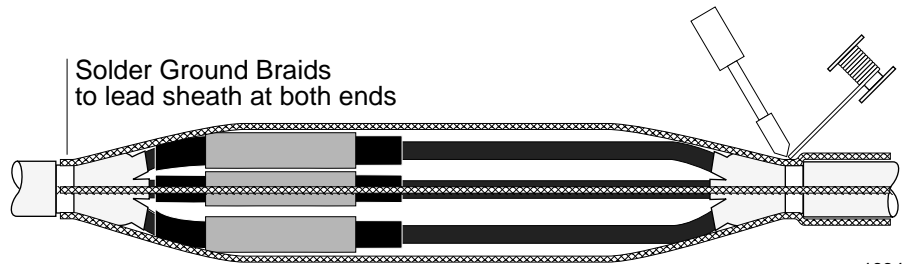
Go to Step 35, page 11.

1821

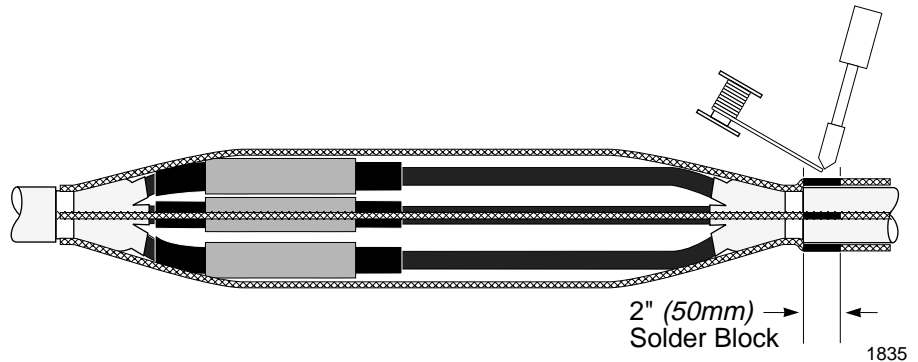
34. Install ground braids with external grounding required.

Space the 3 ground braids evenly around the lead sheath and solder in place.

Lay the braids across the splice tubes and solder to the lead sheath of the other side.



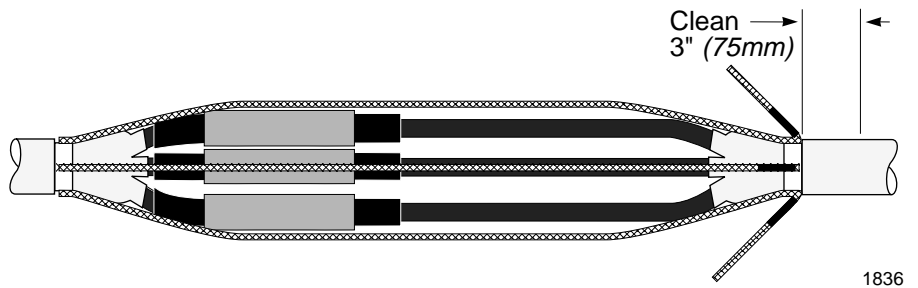
Solder block the ground braids for 2" (50mm), starting at the jacket cutback (or equivalent measurement if unjacketed).



Lay the braids back over the splice.

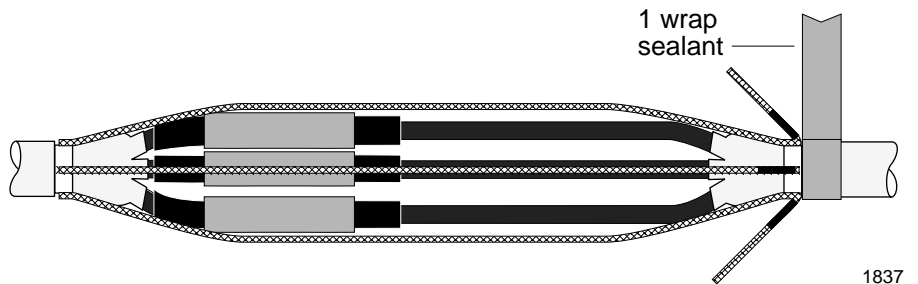
Clean and abrade the cable jacket for 3" (75mm) from the jacket cutback.

Note: If unjacketed cable, clean and abrade the lead sheath for 6" (150mm) beyond the ground braid solder connection.



Wrap one layer of sealant around the cable jacket at the jacket cutback.

Note: If unjacketed cable, wrap one layer of sealant around the lead sheath so the solder block will lie directly on the sealant.



Bring the braids forward and press them into the sealant. Wrap one more layer of sealant directly over the existing sealant and ground braids.

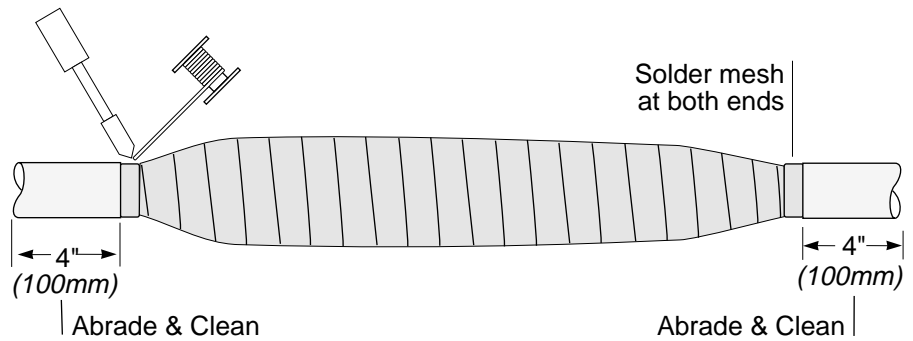


Go to Step 35, page 11.

35. Apply shielding mesh.

Starting at the lead sheath on one side of the splice, wrap one half-lapped layer of 2 inch (50mm) wide shielding mesh across the splice. Solder mesh to the lead sheath on both sides.

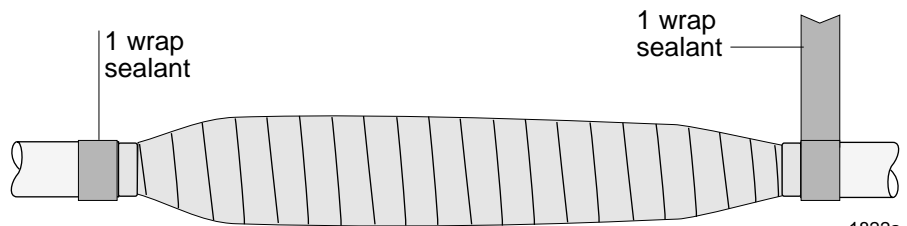
Abrade and solvent clean cable jackets (or lead sheath) as shown using an oil-free solvent.



1822

36. Apply sealant.

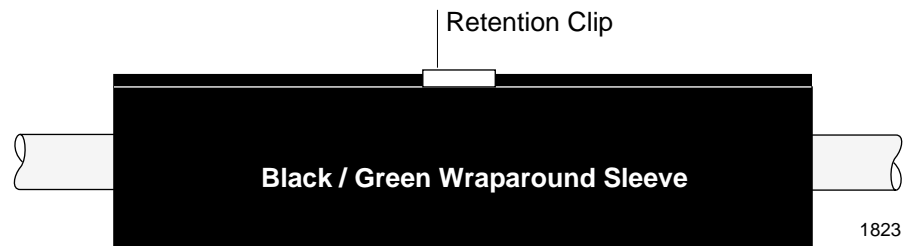
Apply one wrap of red sealant onto the cable jacket on each side of the splice as shown.



1822a

37. Position wraparound sleeve.

Remove or tape over all sharp points to prevent puncture of wraparound sleeve. Remove backing from wraparound sealing sleeve and center sleeve over splice. Slide metal retention clip onto the butted rails.

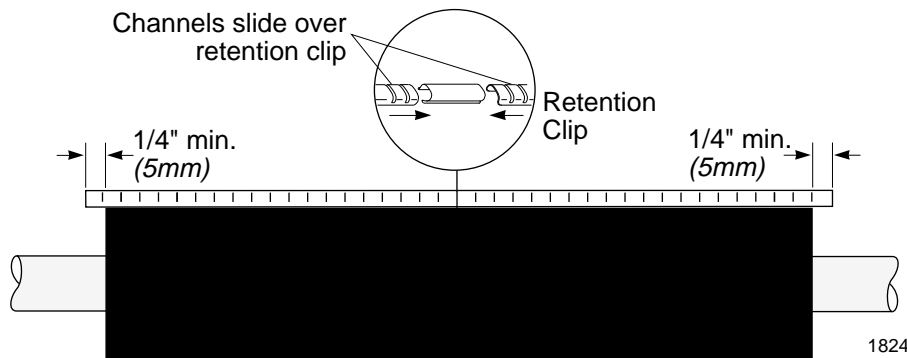


1823

38. Install channels.

Connect the channels by overlapping the retention clip as shown at right.

Note: Channels must overlap sleeve edge by 1/4 inch minimum.



1824

39. Shrink wraparound sleeve.

Preheat evenly along both sides of the rail/channel area until this area begins to shrink. Begin shrinking at the center of the sleeve and work toward each end. Apply heat until the sleeve is fully shrunk and the heat-sensitive green paint is completely converted to black. Continue heating the rail/channel area for another 5 seconds per foot. A white line should be visible in the channel gaps indicating sufficient heating.

Note: Green heat-sensitive paint will turn black as sleeve shrinks in place.

This completes the splice.

Note: Allow to cool before moving or placing in service.

